Remarks

Claims 1-53 were pending. Claims 3, 6-9, 27-30, 32-33, 35-37, 39-40, and 42-53 have been withdrawn from consideration. Claims 1, 2, 4, 5, 10-26, 31, 34, 38, and 41 have been elected for examination. No claims are amended. Accordingly, Applicants respectfully submit that no new matter has been added.

The specification was amended to correct a typographical error.

Based on the foregoing amendments and the following remarks, Applicants respectfully request reconsideration of the outstanding rejections and passage of the claims to allowance.

Election/Restrictions

Applicants acknowledge that the Examiner has determined that claims 4, 5, 10, 26, 31, 34, 38, and 41 are also generic. Applicants also acknowledge that claims 3, 6-9, 27-30, 32-33, 35-37, 39-40, and 42-53 are withdrawn from consideration. Claims 1, 2, 4, 5, 10-26, 31, 34, 38, and 41 have been elected for examination. Applicants respectfully request that if a generic claim is finally held to be allowable, all species should be examined.

§ 102 Rejections

Claims 1-2, 4-5, 11, 18-19 and 38 were rejected under 35 USC § 102(b) as being anticipated by Reznikov et al (U.S. Pat. No. 6,433,850). Applicants respectfully traverse.

Claim 1 recites a method that includes "exposing an alignment material to an interference pattern to cause a chemical reaction in the alignment material." Reznikov does not disclose this feature.

Instead, Reznikov teaches the exposure of an alignment layer of a liquid crystal cell with a sequential illumination of linearly polarized UV lamp light (incoherent light), followed by non-polarized UV lamp light (incoherent light) or vice versa. See Reznikov, col. 3, line 1 – col. 5, line 17, specifically the embodiments of Reznikov's Figs. 3A, 3B, 5A, 5B, 6A, 6B, 7A, and 7B. This type of sequential illumination does not and cannot produce an interference pattern, as is recited in the claim.

Further, Applicants respectfully submit that the characterization of Reznikov's Fig. 2, found on page 3, lines 1-7, of the Office Action, is incorrect. Specifically, Reznikov's Fig. 2

shows a measurement apparatus, in which a lamp 11 exposes an alignment layer 15, then a laser 18 is used only to measure or observe the amount of birefringence caused by the initial exposure from lamp 11, and not to interact with the alignment layer 15. This type of measurement illumination does not and cannot produce an interference pattern, as is recited in the claim. Thus, Reznikov does not disclose "exposing an alignment material to an interference pattern ..." and Reznikov does not disclose "wherein the liquid crystal aligns relative to the alignment material based on the interference pattern." Instead, Reznikov teaches the exposure of a liquid crystal cell with an alternating illumination sequence of polarized and unpolarized lamp light. See Reznikov, col. 3, line 62 – col. 4, line 47.

Accordingly, as Reznikov cannot anticipate the claimed invention, the rejection of claims 1-2, 4-5, 11, 18-19 and 38 under 35 USC § 102(b) as being anticipated by Reznikov et al has been overcome and should be withdrawn.

§ 103 Rejections

Claims 10, 12-15 and 20-21 were rejected under 35 USC § 103(a) as being unpatentable over Reznikov et al in view of Yamada et al (U.S. Pat. No. 6,067,141). Claims 16 and 17 were rejected under 35 USC § 103(a) as being unpatentable over Reznikov et al in view of Margerum et al (U.S. Pat. No. 5,096,282). Further, claims 22-23 and 41 were rejected under 35 USC § 103(a) as being unpatentable over Reznikov et al in view of Kelsey et al (U.S. Publ. No. 2002/0149849). In addition, claims 24-26 were rejected under 35 USC § 103(a) as being unpatentable over Reznikov et al in view of Hirata et al (U.S. Pat. No. 5,652,634). Claims 31 and 34 were rejected under 35 USC § 103(a) as being unpatentable over Reznikov et al in view of Hattori et al (U.S. Publ. No. 2002/0067451). Applicants traverse for the following reasons:

1. **Reznikov and Yamada**

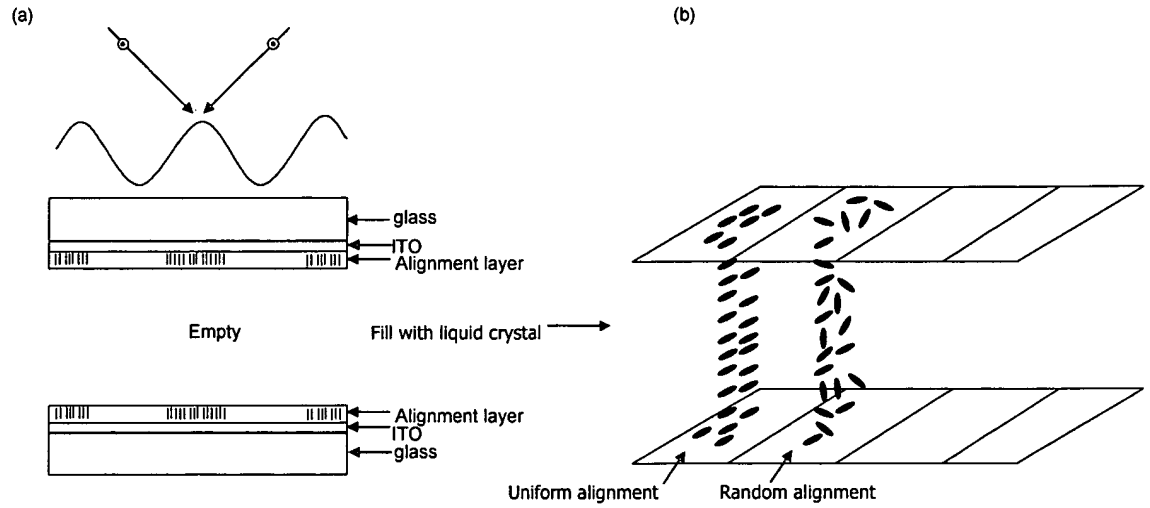
The combination of Reznikov and Yamada does not render the claimed invention unpatentable because a *prima facie* case of obviousness has not been established. In particular, Yamada fails to overcome the deficiencies of Reznikov (described above), in that neither reference teaches or suggests at least "exposing an alignment material to an interference pattern to cause a chemical reaction in the alignment material." Regarding Yamada, that reference is

directed to the application of a voltage across a liquid crystal layer (not an exposure to any light pattern, let alone an interference pattern). Accordingly, even if one of ordinary skill in the art were to have combined Reznikov and Yamada, the combination would not produce Applicants' claimed invention.

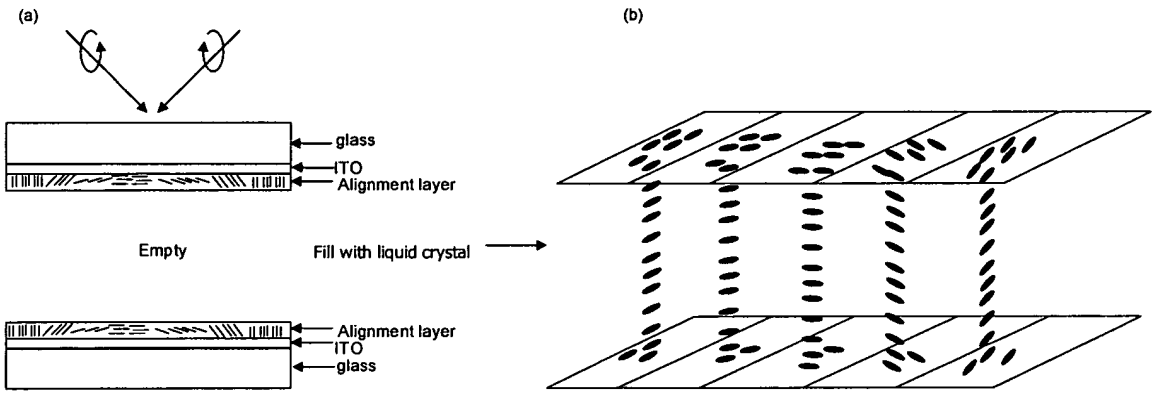
2. Reznikov and Margerum

The combination of Reznikov and Margerum does not render the claimed invention unpatentable because a *prima facie* case of obviousness has not been established. In particular, Margerum fails to overcome the deficiencies of Reznikov (described above), in that neither reference teaches or suggests "exposing the alignment material to a liquid crystal, wherein the liquid crystal aligns relative to the alignment material based on the interference pattern." Margerum is directed to polymer dispersed liquid crystals (PDLC) and uses amplitude gratings to form volume holograms to phase separate out liquid crystal and polymers in volumetric regions. This method does not provide for alignment of the liquid crystal.

The embodiment of claim 1 recites that the liquid crystal is aligned relative to the alignment material based on the interference pattern. Figs. 1(a) and 1(b) (an amplitude interference pattern) and Figs. 2(a) and 2(b) (a polarization interference pattern) illustrate exemplary embodiments of the recited method (see also specification, page 3, lines 21-30, page 12, lines 4-14; page 12, line 26 – page 13, line 4; and Figs 2A, 2B, 3A, 3C, 12A-12G and 16A-16G).



Figs 1(a)-1(b): A sub-micrometer alignment layer coated on ITO coated glass surfaces is exposed to an interference pattern (a). After the liquid crystal comes in contact with the alignment layer, regions of uniform alignment and random alignment can be created in an alternating fashion as shown in Figure (b).

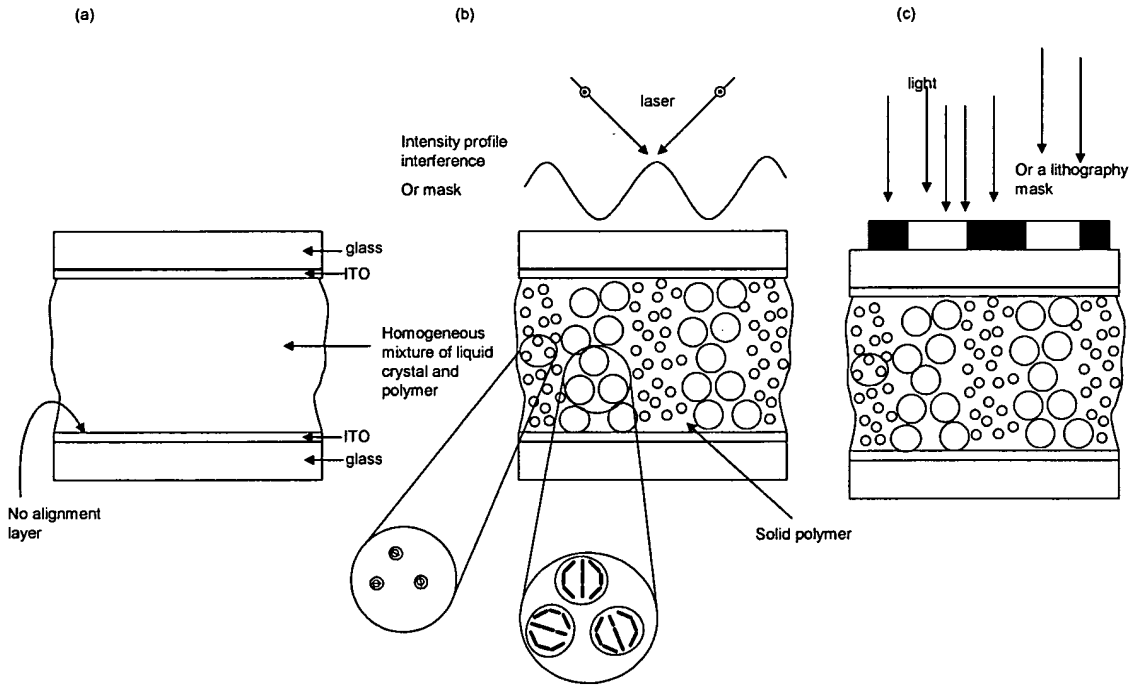


Figs. 2(a) and 2(b): A sub-micrometer alignment layer coated on ITO coated glass surfaces is exposed to a polarization interference pattern (a). After the liquid crystal comes in contact with the alignment layer, regions of uniform alignment rotate through space creating a periodic alignment (b).

In Figs. 1(a)-1(b) above, the bright intensity of light regions (and the corresponding polarization direction) creates a molecular orientation change in the alignment layer shown in Figure 1(a). In the high intensity regions of the interference pattern, there is a high degree of change in the alignment layer and in the dark regions of the interference pattern very little change. After the liquid crystal comes in contact with this surface, it organizes itself in a

periodic way as shown in Figure 1(b) (i.e. alternating regions of uniform alignment and regions of random or disordered alignment). Figs. 2(a) and 2(b) shows yet another embodiment where interference is created to form a polarization pattern using right handed and left handed incident coherent light as shown in Figure 2(a). This results in a polarization interference pattern of constant intensity. The polarization interference pattern creates molecular orientation change in the alignment layer, which rotates through space. When the liquid crystal comes in contact with this surface, a periodic and rotating molecular alignment of the liquid crystal molecules is obtained as shown in Figure 2(b). The alignment direction is directed by the interference pattern.

In contrast, Margerum discloses a method to create polymer dispersed liquid crystals in a patterned fashion. Figures 3 (a)-(c) (provided below) show two ways in which Margerum teaches the fabrication of polymer dispersed liquid crystals, either by interference (see Figure 3(b)) or by an exposure/mask system (see Figure 3(c)).



Figs. 3(a) – 3(c): Schematic illustration of the Margerum patterned polymer dispersed liquid crystal process: homogeneous mixture of a liquid crystal and polymer (3(a)); mixture exposed to an interference pattern making regions of distributions of liquid crystal droplets or bubbles (3(b)); and an exposure through a mask which makes regions of distributions of liquid crystal droplets or bubbles (3(c)).

The process taught in Margerum to create patterned polymer dispersed liquid crystal systems is to expose a homogeneous mixture of liquid crystal and polymer to a bright and dark intensity profile of light that can photo-polymerize the liquid crystal. The homogenous mixture is usually sandwiched between two glass plates coated with a transparent conductor (such as indium tin oxide or "ITO"). Regardless of the exposure process, whether interference or masking techniques, a phase separation occurs in selected regions.

In contrast to the method recited in claim 1, this phase-separated liquid is not aligned in this process – rather, it is distributed into a macroscopic pattern set by the intensity of the illumination. Thus, Margerum fails to teach or suggest either liquid crystal alignment (other than electric field switching-alignment) or alignment layer coatings.

Accordingly, even if one of ordinary skill in the art were to have combined Reznikov and Margerum, the combination would not produce Applicants' claimed invention. As such, Applicants respectfully submit that the pending claims are patentable over Reznikov and Margerum.

3. Reznikov and Kelsey

The combination of Reznikov and Kelsey does not render the claimed invention unpatentable because a *prima facie* case of obviousness has not been established. In particular, Kelsey fails to overcome the deficiencies of Reznikov (described above), in that neither reference teaches or suggests "exposing the alignment material to a liquid crystal, wherein the liquid crystal aligns relative to the alignment material based on the interference pattern."

Kelsey describes a method of holographic or interference lithography, where "holey fibers" (i.e., optical fibers containing regular holes or cavities in the fiber) are used to transport light used to form a holographic pattern. The use of fibers is described as providing for a flexible lithographic tool and allows for the replacement of spatial filters. See Kelsey, paras. 0042 and 0043. Even though, at para. 0054, Kelsey states that "arrays of lines suitable for grating or electrode applications may be obtained by utilizing two or three illuminating beams. Such patterns may also be useful in forming alignment layers for liquid crystal-based devices and displays," Kelsey is silent as to the recited step of exposing the alignment material to a liquid

crystal, wherein the liquid crystal aligns relative to the alignment material based on the interference pattern.

Further, one of ordinary skill in the art would not have been motivated to modify Reznikov by replacing the two source illumination system with Kelsey's holey fiber lithographic system, because Kelsey's lithographic illumination does not provide an alternating illumination sequence of polarized and unpolarized incoherent light, which is required under Reznikov's process. Moreover, such a proposed modification would render Reznikov's method unsatisfactory for its intended purpose, which is to follow a first exposure with a second exposure to select a particular pretilt angle (see Reznikov, Abstract), not to create a periodic surface structure. Under MPEP 2143.01, "The proposed modification cannot render the prior art unsatisfactory for its intended purpose."

Accordingly, Applicants respectfully submit that the pending claims are patentable over Reznikov and Kelsey.

4. Reznikov and Hirata

The combination of Reznikov and Hirata does not render the claimed invention unpatentable because a *prima facie* case of obviousness has not been established. In particular, Hirata fails to overcome the deficiencies of Reznikov (described above), in that neither reference teaches or suggests "exposing an alignment material to an interference pattern to cause a chemical reaction in the alignment material." Hirata does not teach or suggest exposing an alignment material to an interference pattern. Instead, Hirata teaches a mask exposure method, whereby the mask is moved after initial exposure (see e.g., Hirata, col. 14, lines 6-18).

Accordingly, even if one of ordinary skill in the art were to have combined Reznikov and Hirata, the combination would not produce Applicants' claimed invention. As such, Applicants respectfully submit that the pending claims are patentable over Reznikov and Hirata.

5. Reznikov and Hattori

The combination of Reznikov and Hattori does not render the claimed invention unpatentable because a *prima facie* case of obviousness has not been established. In particular, Hattori fails to overcome the deficiencies of Reznikov (described above), in that neither

reference teaches or suggests "exposing an alignment material to an interference pattern to cause a chemical reaction in the alignment material." Hattori does not teach or suggest exposing an alignment material to an interference pattern. Instead, Hattori teaches sequential exposures to UV radiation. See e.g., Hattori, paras. 0151 and 0152.

Accordingly, even if one of ordinary skill in the art were to have combined Reznikov and Hattori, the combination would not produce Applicants' claimed invention. As such, Applicants respectfully submit that the pending claims are patentable over Reznikov and Hattori.

For at least the reasons stated above, the cited references, either taken alone, or in combination, do not teach or suggest the features recited in the independent claims. As such, Applicants respectfully submit that the pending claims are patentable over the cited references.

Conclusion

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested. Please contact the undersigned should there be any questions or in order to expedite prosecution.

Respectfully submitted,

9/22/05
Date

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